Sugar and Salt—Food or Poison?

A. H. Emil Gibson

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Sugar and Salt—
Foods or Poisons?

Axel Emil Gibson

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Foods or Poison?

BY
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Author of "Prolonging Human Life Through Diet."

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To

Luther Burbank---

whose untiring labors in the service of humanity have made him a prophet and a seer of the divine life in man and nature---is this little volume lovingly and gratefully dedicated.

INDEX

SUGAR—PART I

Preface.

I. Has the Popularity of Sugar a Scientific Basis?

II. Sugar as an Extract, and Sugar as a Natural Product.

III. The Constructive Phase of Sugar.

IV. The Magic of a Chemical Formula.

V. The Destructive Phase of Sugar.

VI. Excess in Food-Failures as Nourishment.

VII. The Philosophy of Excess and Balance.

VIII. The Difference between Organized and Unorganized Acids, and their Relation to Rheumatism.

IX. The Peril of "Free Sweets."

X. The Place of Sugar in the Hygienic Bill-of-Fare.

XI. Sugar an Explosive Force in the Human Dynamo.

INDEX

XII. Can Sugar Alone Maintain the Expenditure of Muscular Labor?

XIII. Sugar as a Force.

XIV. Sugar as a Fatformer.

XV. Sugar as a Poison?

XVI. Sugar as a Medicine

XVII. The Moral Application of "Free Sweets."

SALT—PART II

XVIII. Evidence For and Against the Use of Salt.

XIX. The Fundamental Purpose of Salt.

XX. Salt at Once a Preservative and a Destroyer.

XXI. The Meaning of "The Salt of the Earth" to Physiological Chemistry.

XXII. How Salt at Once can become the Savior and Destroyer of Life.

XXIII. Can the Body Absorb Mineral Substances?

INDEX

XXIV. The Fallacy of Dr. Willjamar Stephanson's Theories as to the Value of Salt.

XXV. Why the Esquimo Abhors Salt in His Dietary.

XXVI. Why Life in the Temperate Zone Needs Salt for its Maintenance.

XXVII. Correspondence Between "Free Sweets" and Loose Morals.

XXVIII. The "Salt" and the "Sweets" of the Earth.

XXVIV. The Value of Salt in Medicine.

XXX. The Value of Salt in Food.

PREFACE

When sitting at your breakfast-table and quietly enjoying the drink that cheers, but not inebriates, it may not occur to you that the lump of sugar you just slipped into your cup, relates you to principles and force-aspects that have the profoundest bearing, not only on your physical, but also on your mental and moral nature.

For if thoughts are things, so, on the other hand, things must be thoughts. Proceeding from within, outward thoughts are things, while from without inward things turn into thoughts. They are interchangeable as-pects of cause and effect, and relate man to the sources and expressions of universal principles.

This means that the principle of "sweetness," which has in sugar its material expression, has on the moral plane the subtler, but not less forceful expression of temptation. In other words, the same principle which in the seductive form of sugar appeals to the gustatory instincts of the physical man, appeals with still greater force in the form of moral "sweetness" to the inner man.

Life is a woof, progressing under the for-

mative action of cause an effect, action and reaction, impulse and motive; while throughout its entire fabric runs the directing or supporting lines of principles, guaging its advance, unifying its expression and unfolding its purpose.

This gives to man's place in nature at once its reality and its mystery. His relation to the universe becomes freighted with the gravest and most far-reaching importance. He becomes a subject of cosmic dominion, yielding with equal felicity to the scalpel of concrete dissective science, and the abstract measurements of intangible metaphysics. The solution to the human equation is no longer to be worked out on one plane, but on all planes.

From a close study of human motives in their relations to the conflict between the needs of man and the supply of nature, between the appetite of the senses and the recoil of their gratification—we will learn to decipher the signboards of evolution, and become more able to adjust our means of time to the ends of Destiny. The temptations that swerve us in our attitude to diet, and cause our failure to rationally relate means to ends, enjoyment to purpose, etc., are at present confronting the indi-

vidual with an intensity that in many cases threaten him with extinction. And the agent which today exerts the greatest influence on our sense-life in relation to food is sugar. The dominating ingredient in most of our dishes, sugar perverts our taste, blinds our instincts, bewilders our gastric consciousness, and leaves us guidelessly and aimlessly adrift in the rapids and breakers of morbid and despotic cravings, not infrequently decoying the individual into body-and-mind-destroying excesses.

In the book before you a bold attempt has been made to explain the weird power which sugar holds over the taste of the highest advanced culture-folk of the world today. At the same time it will convey a knowledge of the principle which translates into terms of moral temptations, on the plane of the mind, the "sweetness" or attractiveness which, as *sugar*, it exerts on our body through the sensation of taste.

The reader will also learn that our attitude to sugar, as an element of food, will react with positive force on our moral nature in the construction of character. The Master was right: "What ye bind on Earth, will be bound in Heaven." In our daily routine existence, as we relate ourselves to current events, we are offered the key of

St. Peter, with the power to unlock the moral and intellectual treasures of man's highest nature.

And furthermore, as it is not in the uses of sugar, but in its misuse and abuse that we evoke the Nemesis of nutritional disaster, so on the moral plane, we will find that as long as passion remains our servant, and under the control of our judgment, it will act as a lever of incalculable mental and moral force in the building up of will power and character.

As with sugar so with salt. The relation of the latter to the moral life and destiny of man, is no less significant than the former. Both stand for principles adherent in the deepest springs of human nature. In salt, we have the mystic "Rock of Ages," the "Elixir of Life," and the "Philosopher's Stone," all in one. But its nature, like the Sphinx, is double-faced; it relates us both to life and death; to health and disease. It may set free by evaporation, or imprison by crystalization. From the standpoint of principle, it may give to our character the stability of the "Salt of the Earth," or crystalize our intellectual life into the rock-salt pillar of the symbolic wife of Lot.

Sugar and salt are the symbols of man's dual nature, the balancing forces of his vast,

complex evolution. As servants they raise him in the scale of life and power; as masters they destroy him.

"At the gate of every Eden," said Mohammed, "hangs a two-edged sword." In the Eden of Health, this sword is represented by the duality of Sugar and Salt.

SUGAR AND SALT— FOODS, OR POISONS?

By

Dr. Axel Emil Gibson

CHAPTER I

HAS THE POPULARITY OF SUGAR A SCIENTIFIC BASIS?

Without possessing the fatal fascination of a narcotic, sugar exerts a greater attraction on the human race than any other element of the dietary; and strange as it may appear, there exists a positive relation between a people's demand for sugar and the standard of its culture.

Thus we find the Anglo-Saxon race to be the greatest of the world's sugar-eaters. In the statistics of the United States Government, collected in the year of 1910, we find that the average citizen of this country and Great Britain consumes yearly more than half his own weight, or 80 lbs. per capita. Next in the line of sugar-loving culture-people come Denmark, Sweeden and Norway, with their respective 70 and 65

lbs. per average man, woman and child. Then follow Germany, France and Holland, with their tribute to the Monarch of Taste, at the rate of some 50 lbs. each, while at the end of the list we find Italy, Greece and Turkey with a sugar consumption of somewhat less than 23 lbs. per head. Last year's consumption of sugar in the United States alone exceeded 7000 million pounds.

This universal popularity of sugar, especially among nations where the tide of culture touches its high-water mark, has its cause and explanation in the readiness by which it gives off a maximum of energy with a minimum of digestive labor. The tension of modern life with its prodigious expenditure of muscular and nervous energy demands a quick combustible to facilitate rapid metabolic exchanges. Such a combustible, or ever-ready generator of muscular and nervous energy is found in sugar. Suspended in its bosom is held storage batteries of incalculable power, ready to be discharged in response to physiological needs and necessities. But the relation between the demand and the supply, in order to produce nutritionally safe results, must be metabolically balanced, and proceed in accordance with physiological and biological principles. Through the culinary

excesses in modern living we have ruptured the chain of vital reciprocity by which Mother Nature relates herself to the entities of universal evolution. The ingenuity of the human intellect, stimulated by a selfish desire to gratify an undue and unnatural craving for extracted and concentrated relishes, has devised expediences by which nature can be "held up" so to speak, and coerced to yield gustatory sensations in excess of the powers of digestion and assimilation. One of the strongest, and at the same time most serious temptations in the life of an individual lies in his natural but over-indulged and hence overgrown desire for "sweets," not only on the physical plane, but as a mental attitude, on all planes.

This craving for "sweets," experienced more or less by every creature of evolution, has a deep meaning in its relation to the unfolding and maintenance of life and growth. The function of sugar in evolution is unique and fundamental, having for its purpose to re-charge the cells of every entity with the vital force of structurel rejuvenescense. Introduced into the system in its natural, vegetative combinations, it starts chemical reactions in the responsive physiological functions, from which arise those cellular, unorganized vital enzymes, or ferments, which form the

basic elements in all successful digestion and nutrition."

It is thus readily seen why the creatures of evolution should worship at the shrine of this powerful, nutritional, stimulant. . . The engines of life—the innumerable cells of the organism—are kept in action through the combustion of the sugar molecule. The energy liberated from the breaking up of this persuasive element is instrumental in rising the whole organic world into levels of progressive unfoldment of power and substance. It constitutes the Atlas of a biologic Cosmos, maintaining the nutritional and physiological balance of organized existence.

CHAPTER II

SUGAR AS AN EXTRACT, AND SUGAR AS A NATURAL PRODUCT

The fact that no natural sugar occurs without being atomically balanced by carbon, leads us to the conclusion that its composition, the formula of which is C6, H12, O6, is an atomic or ionic charge of H. O., held in chemical sequence by the carbon envelope. Brought in touch with organizations that demand sugar for their growth and sustenance, the affinity evolved through the interaction of the different elements, may rise to an intensity overcoming the controlling power held by carbon over its compound. This transit of the sugar molecule from its carbonic envelope to the trophic cell of an organism, under the process of affinity, constitutes the basic principle and governing conditions in the entire chemistry of nutrition. In other words, chemical affinity, in its action on the digestive and assimilative processes, brings out the principle of supply and demand in the field of physiological economy: hence the physiological value of sugar depends on the character

of its origin—whether naturally or artificially obtained. With natural sugars we mean the sweets prevailing in nature, as fruit and vegetable, before they have become subject to the processes of extraction and concentration demanded by the jaded sensibility of an over-stimulated and hypertrophied appetite.

At the head of the natural sugars stands Grape-sugar, or Dextrine, introduced by its carbon carrier in the form of a saturation-compound, and appearing as a complete molecule under the chemical formula C6, H12, O6. By this is indicated that Dextrose stands for a complete, integral, permanently self-sustained compound, in which Carbon, with its four valencies, or powers of affinity, redoubled or reinforced six times, is adequate to hold in a firm grip the single unit-power of the Hydrogen molecule—doubled 12 times, and the two-armed power of oxygen—doubled 6 times. Or, in other words, the valency or power of affinity of carbon amounts in power to the combined valencies of Hydrogen and Oxygen—viz:

Oxygen, 2x 6—12
Hydrogen, 1x12—12.....24
Carbon, 4x 6—24.....24

The formula governing this compound comprises the whole group of natural sugars,

such as Grape-sugar, Fruit-sugar, and other Monosaccharides. Complete, and chemically satisfied with every atom of the compound structurally engaged, the formula C6, H12, O6, introduces nature's own method of supplying her creatures with energy adequate to meet the needs and conditions of a complex evolution. Hence the congenial and energizing influence of fruit, vegetables, milk and honey upon the system, having the power to combine taste with virtue, impulse with permanence, and stimulation with normal growth.

CHAPTER III

THE CONSTRUCTIVE PHASE OF SUGAR

In its natural condition, as vegetable and fruit, sugar performs the supremely vital and constructive function in the physiological economy of the body, to acidify and subsequently to dissolve the slowly accruing crystalizations of waste-deposits in the capillaries. The modus operandus, by which this process is accomplished, is at once supremely grand and supremely simple. When, in the course of excessive feeding, the capillaries and lymph-spaces become clogged up with crystalizations of accumulated urates, oxalates, carbonates, ammonia, etc., the system, by an ingenious process of self-governing adjustment, has the power to change the normal alkalinity of the circulation into a temporary condition of acidity, so as to be able to dissolve the constantly increasing blockade of toxines in the vascular exchange. This change is affected by the natural, unorganized—i. e. non-bacterial —acids imparted into the system by fruit. For the sugar of the fruit, when assimi-

lated by the system, gives rise to normal fermentative processes resulting in the formation of the above acids, whose usefulness to the system consists in dissolving crystalized waste matter. On the other hand, the magnesium, potassium, sodium and other organic tissue salts contained in the fruits, have the power to engender a return of the acidified blood back into its normal state of alkalinity. Thus Nature wields, in one single hand, the knife of the surgeon and the balm of the nurse—the dissolving fires of the acids and the restorative alkalinity of the salts.

The acidulation of the *natural sugars* in the system is attended by physiological emergencies. The greater percentage is turned into fat and energy. Acid depletes—excavates. Sugar repletes—renovates. Acid, by its chemical fire, reduces organized waste-products and tissue-poisons into ashes; sugar, by its chemical affinity for organized poisons, absorbs the pathological wreckage thrown into circulation, and removes the blockade from the ducts and channels. Acids lower the temperature of the system, by dissolving the decayed and fermenting substances held suspended in the various tissues; sugar restores the normal degree of temperature by virtue of its chemical affinity for the

liberated poisons—extracting and conducting them out of the system.

So far, so good; but while the power of Nature to maintain the working standard of constitutional health has its seat and condition in a normal balancing in the system of salts and sugars, obtained from the fruits and vegetables—in order to meet the exigencies of obvese environments and abnormal situations—nature, in her ever-present resourcefulness, often takes recourse to abnormal means. Thus, in the great vital economy of existence, what may stand for unhygienic and illogical food combinations under one set of conditions, may, under the stress of reversed conditions, become the very means necessary to restore a disturbed physiological balance. We may therefore find that in the countries of the North, where fruits are scarce, or absent, a moderate indulgence in *extracted sweets*, are not only physiologically tolerable, but may be necessary. Jellies, jams, and fruit-preserves, in themselves mere dead and emblamed fruits, nevertheless, under certain conditions are valuable agencies of muscular and nervous energy. To the extent, however, that nature is adequate to supply our dietary directly from her own faultless cuisine, where the sun does the cooking and the

earth the seasoning, any procedure to stimulate taste and appetite by artificial mixtures will only result in invoking the Nemesis of a disordered stomach and liver. Only in regions where nature is barren, and fails to meet the demand of our system for a balanced nutrition, are we justified in preparing, artificially, the required food-supply.

CHAPTER IV

THE MAGIC OF A CHEMICAL FORMULA

The enormous difference between sugar as a health-promoting, and sugar as a health-destroying power, is represented in the displacement of a single figure in its chemical formula. In chemistry, if anywhere, figures do not lie. The formula back of the whole series of artificial or extracted sugars—C12, H22, O11—shows at once that its compound is spurious and not in a position to supply the system with its congenial, normally-adequate needs of energy. A dissection of the formula reveals its inadequate and unbalanced structure.

Hydrogen, 1x22—22
Oxygen, 2x11—22.....44

Carbon, 4x12—48.....48

which means a balance of unsatisfied affinities amounting to −4.

Thus we see how, in this spurious compound, carbon enters the field of physiological chemistry with two unsatisfied valencies for Oxygen,

which means that the digestive system has to fill the ensuing elemental vacancies with its own supply of Oxygen. That is to say, that artificial sugar comes into the system with a demand in place of a supply, and with its unsatisfied affinities threatening the solidarity of every tissue, subject to its power. Under the category of artificial sugars we comprise cane-sugar, malt-sugar, milk-sugar and the various forms of disaccharides in extracted fluids or crystals. Indulged in as means of increasing the flavor of foodstuffs, in themselves complete, such as cereals, vegetables and ripe fruit, this artificial form of sugar proceeds to re-establish its ruptured chemical balance at the expense of the body's own nutritional storages. Sooner or later this brings the system into a state of general functional and structural bankruptcy.

CHAPTER V

THE DESTRUCTIVE PHASE OF SUGAR

An analysis of the natural and extracted sugars shows unmistakably the dangerous character of the latter, when used indiscriminately in the preparation of foods:

	Natural Sugar	Artificial Sugar
Potassium	30.19	28.79
Sodium	10.42	2.89
Calcium Carb	2.60	10.93
Magnesium	4.71	1.16
Iron	3.23	1.68
Sulphur	4.85	4.69
Water	44.00	
	100.00%	50.14%

Now it is in this mutilated form that sugar works its ravages in the human nutrition. Subjected to the processes of digestion and assimilation, it forms a nutritional vacuum in the system by which is generated a protracted suction or urge towards a restoration of its disturbed elemental balance; a suction, which, like a thousand-armed octopus, extends its fibres to every center of the

organism. As it is Potassium and Sodium that are especially subjected to the raving affinities of the extracted sugar, it is in the attack on these highly important tissue-salts that the deadliest blows are dealt to health and life. And, furthermore, as the function of these salts is to drain and clean the tissues of poisonous substances, their absorption by the chemical action of the sugar means a retention of the carbonic, lactic, oxalic, uric and other acids, and the subsequent formation of obstructive deposits in the tissues and capillaries. This again means high blood-pressure, with cellular asphyxia and auto-intoxication, which if continued must, in the course of time, give rise to permanent functional disorders of liver, kidneys and lungs. Furthermore, as retarded circulation and subsequent incomplete oxygenation of tissue-wastes generates adipose or fatty tissue in the body, it is readily seen how the indulgence in free sugars can give rise to fat, and why fat is a very unreliable sign of health. It is only a question of time when adipose tissue, if continued to be formed, will terminate in Adiposis, or fatty degeneration.

CHAPTER V

EXCESS IN FOOD — FAILURE IN NUTRITION

In the geat economy of nature, with its ever-present adjustment of supply to demand, of gratification to need, etc., we find all along the highway of evolution the presence of certain guide boards or danger signals, reminding the individual of the perils which lie in wait for the trespassers.

It is there curring verificationon a universal scale of the statement of the great Mohammedan Prophet, that at the gate of every Eden swings the two-edged sword of life and death.

It is the sword of moral balance, suspended over the alluring field of gratification and excess, for were it not for this corrective of suffering, following upon the heels of excess, the creatures on the stage of evolution would long ago have been blotted out of existence through self-destruction. It is only through the unerring and unrelenting readjustment, unfolding along the chain of guilt and punishment, that an overwhelming

percentage of humanity is kept from extinction.

Excess strikes the limit of the evolutionary scale of balance. Whether this excess has its balance in sugar or salt, in carbon or nitrogen, in acids or starches, its course is linked with sensuous gratification on a basis of personal egotism, and followed by the inevitable train of vital exhausture and systemic breakdown,—a breakdown which has its closing event in some or other phase of functional arrest, indicated by a gradual hardening of the tissues of the organism. Thus arise the more or less grave ailments known as Arterio-Sclerosis, Induration of the Liver, Arthrodial Rheumatism, Interstitial Nephritis, Cardiac Ossification, etc., which all stand as immutable state-evidences in the court of physiological equity, testifying to inroads in the field of self-indulgences and excess. With all the differences inherent in the various forms of dietetic transgression, both as to principle and process, in this final phase of nutritional excess, they all join issue:—the reaction from over-stimulation into conditions of functional arrest, and the subsequent breakdown, from congestion of the tissues and viscera, into their crystalization. Under specific conditions, however, when its consumption is gauged by a biological and

nutritional balance, sugar may rise the cellular activities of the system in to the highest standards of efficiency. Its swiftness of combustion and readiness to generate nerve-power, swells the tides of the vital currents in the organism, into ever higher levels of functional efficiency and structural endurance.

FOOT NOTE.—This law holds good on all planes—in mental not less than elemental nature. It maintains with unfailing safety the physical, mental and moral balance of the universe. From the dispersion of a thunderstorm to the breaking up of a fever; from the neutralization of a chemical eruption to the assuaging of a raging passion, this same principle holds good—the neutralization of a movement by the progeny of its own convulsions. In other words, the unemployed excess of energy, generated by an unleashed and uncontrolled nature-force, seeks in the formation of a new center or nucleus a fresh field for its activity, while, parasite-like, it proceeds to feed upon its own parent substance.

In the breaking up of organic crystalizations, by converting the system from a normal state of alkalinity into a critical state of acidity, this same law is at work, balancing up the debit and credit columns of physiological economy. It represents the principle of self-adjusting intelligence, inherent in every atom of the universe, from the system of man to the system of suns—converting waste products of excess into means and methods of order, harmony and growth.

CHAPTER VII

THE PHILOSOPHY OF EXCESS AND BALANCE

In its relation to sugar, the philosophy of excess and balance unfolds one of the most profound schemes ever manifested in the evolution of life. At once a depressant and a stimulant, a check and a motor, sugar, by its quality of effecting instantaneous chemical changes from alkalinity into acidity, has the power to dissolve the organic crystalizations of nutritional wastes, which have been formed through excess, and stored up in the muscles and capillaries of the system. At a given moment, when under the strain of a constantly increasing avalanche of crystalizations, which threaten to break through the walls of the capillaries, the vascular strain reaches its limits of endurance, the blood, by the magic of true alchemy, changes its nature from normal alkalinity to temporary acidity. By this wonderful expediency, nature saves the situation, and restores the physiological balance to the system. The power of natural acids to dissolve the uric and carbonic crystalizations, lodged in

the muscles and capillaries, sets free the circulation from its deadly octopus, and the chemical constitution of the blood returns to its normal alkalinity.

FOOT NOTE.—It is through the action of natural sugar that the blood has the power to affect this marvelous piece of chemistry. Nor do these changes take place in the human body alone; they occur in the field of general vegetation as well. Back of all acidity we find the formula, $C_6H_{12}O_6$, which is also the index on natural sugar. The flavor of the fruit prevails in sweetness or acidity, just to the extent its sugar is converted into acid, or its acid converted into sugar. Thus, in the lemon we find the entire biologic contents of the tree converted into acid, while on the other hand, in the pear, the acid is held in abeyance, the sugar alone occupying the field. Again in the apple, prune and cherry, the elemental transmutation has affected an intermediary balance. Sugar and acid are the two interchanging phases or poles of biogenic unfoldment, springing out from the vast, slumbering storehouse of starch, which in its turn has its birth in the womb of carbon. For in carbon we have the great archaic matrix, or repository, in which the whole organized zone of life has its seat and center of unfoldment. The steps of organic ascent of life can thus readily be verified. Out from the carbon, on the threshold of the inorganic, unawakened world, arises the vegetable kingdom, unfolding and organizing its biological properties in a zone of starch. In the latter is formed the volatile compound of sugar; while out of sugar, like a purging, refining, regenerating spirit, is born the acid.

CHAPTER VIII

THE DIFFERENCE BETWEEN ORGANIZED AND UNORGANIZED ACIDS, AND THEIR RELATION TO RHEUMATISM.

Taken in its natural form as fruit or vegetable, sugar performs the function of a nutritional balance, promptly removing, by its strong affinities, any hardening or crystalization of tissue arising from errors and excesses in the human dietary. But if in disregard of Nature's plain indications, sugar is consumed in its artificial form, as the extracts or compounds of commerce, the process becomes altogether different. As the system of nutrition has no way of employing in its economy this extra, uncalled for, and consequently unused supply of sugar, the latter becomes a vagrant and a hindrance to the sweep of the vital energies that keep the metabolic exchanges of the system in balance and order. And it is here, in the nutritional disturbance thus given rise to, we find the cradle for that long chain of morbid progeny which forms the ghostly

procession of the constantly increasing number of modern ailments. Foremost in this procession, we have congestion, catarrh and rheumatism. This is a phase of physiological chemistry which is of greatest importance to the student of human nutrition. The chemical action at work, transforming natural sugar into natural acids of the living fruit, differs fundamentally and essentially from the chemistry by which artificial or extracted sugars are changed into the organized acids of bacterial fermentation in the system. For the latter process involves the action of what is called "organized enzymes," by which is meant that the ensuing fermentation is due to the presence of bacteria feeding on the artificial sugar circulating in the system,—a process which gives rise to the pathologic phase of acidity recognized in the various forms of indigestion, dyspepsia and general acidity of the system. In place of acting as a solvent on the crystalizations deposited in the body tissues of the organism, these acids add directly to the morbid processes already present.

This accounts for the common belief that "acids" give rise to rheumatism and furthermore, as fruit is regarded as the general source of the acids, the first advice of the

old time doctor in a case of rheumatism is to eliminate this wholesome article from the dietary. The significance of this dietetic mistake is more readily appreciated when we realize that not only do the fruit-acids act as a solvent on the crystalized waste products, but the natural sugar contained in the fruit, by transforming itself into acid, aids the elimination, and thus lays bare to us the very heart of the fruit-and acid delusion. It is the atrificial sugars, the extractea and concentratea "sweets" of the preserves, the syrups or candies of commerce, converted by an unsuccessful digestion into the organized acids of bacteral fermentation, that give rise to rheumatism;—not the wholesome sweets and acids, contained in the natural fresh fruit.

CHAPTER IX.

THE PERIL OF "FREE SWEETS."

It is doubtful whether any extractions or extortions from the storages of elemental nature have brought the transgressor to more disastrous ends than the consumption of what has been termed "free sweets."

Now by "free sweets" is meant the sacharide substance extracted by mechanical or chemical means from sugar-bearing trees and plants, at the expense of the vital poise physiological balance of the fruit as the latter, transmitted as food into the system of nutrition, goes to build up the animal and human organism.

Suspended as a vital ingredient in the product, and balanced in its nutritional action by other elements, present in the plant, grain and fruit, such as the fats, starches and acid,—sugar becomes the indespensible source to the fat, heat and energy necessary to the normal functioning of the body; while on the other hand, in the form of concentrated and isolated extracts, the action of sugar becomes the very opposite: a vio-

lent combustible, destructive in place of constructive. In other words, — permitted to form an integral, undisturbed part of its fruit or vegetable origin, sugar represents the safe and practical household fuel, perfectly under control, and well suited for its purpose; while when extracted or concentrated, its nature becomes changed into a dangerous explosive,beyond the power of control, and unfolding in a train of ever threatening accidents.

Now it is this readiness of sugar to yield physiological combustion, that accounts for its immense importance in the process of digestion, oxygenation and assimilation. Its strong affinity for Carbon,Uric and Oxalic acids and other waste poisons of the body, equips it with power to break up the toxic compound of the latter, and thus to set free and cause to be eliminated the compounds of these tissue poisons. Carried by the blood stream to the lungs, its swift oxygenation renders the entire mass of chyle porous to the purging and vitalizing action of oxygen Hence in its normal combination sugar constitutes the ever stirring, impelling energy in the vegetable world, pushing the molecular compounds of the latter into processes of incessant combustion and constitutional reconstruction.

But on the other hand, if sugar is introduced into the system as an extractive, and consequently in excess of nutritional needs, its very readiness to absorb oxygen causes it to monopolize the latter, almost to the exclusion of the rest of the chyle, thereby preventing the circulating proteids from coming in touch with the pulmonary ignition. A physiological combustible, sugar, when suspended in the blood stream, explodes at the first touch of the igniting oxygen, and if present in excess, will prevent the heavier less ignitious, nitrogenous material of the blood from becoming oxygenated. This "advanced ignition" so to speak, with its natural consequence of leaving the starch and proteid substances only partially oxygenated, will sooner or later, lead the system into grave nutritional disorders. For as the exposure of the swift moving blood-stream to the air current, sweeping through the lungs, is only momentry, it follows that the chyle,in place of being oxygenated and transformed into nourishing, regenerated blood, is turned into a devitalizing, degenerating poison, starting processes of decomposition and decay in the body tissues. The pathological accretions thus arising gradually calcify into forms of rheumatism, gout, catarrh etc., wherever the curves and windings of

the venous and arterial passages of the body impede the flow of the blood stream and it generating action.

The more direct and immediate effect on the digestion due to an excessive consumption of the "free" or extracted sugar, is experienced in the "sour stomach", belching of gas and general dyspeptic disorders, etc., and refers to an action similar to that already described in the relation of sugar to the lungs. Its readiness to combine with oxygen breaks up the hydrochloric acid molecule in the stomach and thus precludes the proteid foods from being acted upon by the gastric juice. Suspended in a temperature of some 97° and bathed in alkaline-pepsin (non-disinfectant) secretions, the food, after a longer or shorter exposure, is passing into partial or complete decomposition, according to the constitutional strength of the individuals' digestive power to counteract the ensuing morbid conditions. If the the dietetic transgressions are continued, the final result of bacterial invasion auto-poisoning and organic breakdown—becomes inevitable.

In its action on the physiology of nutrition, "free sugar" gives rise to other disorders in the system. Suspended in the blood-stream, it exerts a similar influence

on the iron, contained in the latter, as on the iron active in the chemistry of the soil. According to Prof. E. T. Wright, author of "Plant Disease" (London, 1903), it has been proved by analysis that an unstable quantity of iron is extracted from the soil in every crop of cane sugar, which, in the course of a few years cultivation, results in the total withdrawal from the soil of its entire iron supply.

Now as the iron percentage of sugar is greatly reduced through its processes of extraction and concentration, it follows that the first engagement of the sugar molecule, upon entering the system, is to replenish its own vacuum, *i. e.*, its diminished balance of iron, by a direct chemical absorption of this element from the blood.

And furthermore as iron constitutes the balancing lever between inspired oxygen and expired carbonic acid gas in the processes of breathing, it follows that the departure of the iron molecule from the blood corpuscle means a retention of the carbonic acid gas in the tissues, with the subsequent poisoning of the various organs and viscera of the entire system. The numerous cases of anemia, myopia, and nasal catarrh, which occur almost like an epidemic among our candy-devouring school-children, are certain-

ly strong indications of the ravages wrought on the system by the excessive indulgence in free sugar.

CHAPTER X.

THE PLACE OF SUGAR IN THE HYGIENIC BILL-OF-FARE

On the basis of the foregoing, it becomes easier to realize the true charatcer and value of sugar as a product of *extraction*. As a quickly assimilable substance, sugar may even in its extracted form be a valuable source of energy for the system. Wisely combined, or better still, not combined at all, sugar is more readily converted into heat, fat and energy, than any other known food stuff. Taken in its natural, unextracted form, such as carrot, beet, turnip, etc., it enters by two steps the field of absorption. Conversion into dextrine, through salivation, and into dextrose, through intestinal digestion. This makes it ready for systemic absorption and utilization in terms of energy, heat and fat;—the latter however involving further and more complex processes in the chemistry of nutrition. Sugar is an evolution of starch in the vegetable kingdom, and from acids in the kingdom of fruits. Hence a piece of free sugar, whether extracted in the human stomach, from a baked potato, a corn muffin,

or a carrot; or extracted in a sugar factory from the sugar cane or beet—involves principally the same processes: the dextrinization of starch into sugar.

So far, so good. The system accepts the output of the sugar factory with apparently the same readiness and utility as the output of her own gastric industry. A lump of sugar from one of the Jamaica cane sugar refineries, is converted into heat and muscular energy with the same practical result, and followed by the same stimulation of the system, as a measure of glycogen poured by the liver into the stream of nutrition. The difference is not so much to be found in the facts of its manufacture, as in the facts of its combination with other foodstuffs of the daily diet.

Hence a stick of pure candy, or a lump of plain sugar—if enjoyed at a time when the stomach is empty, and no fermentation of other foods possible, may not only be harmless to the normal and healthy stomach, but even be of great value in moments of exhausture, owing to its quickly available sources of energy. The same may be said as to the enjoyment of ice-cream. If pure, and taken when the stomach is empty, ice-cream may be a most congenial and effective form of light nourishment to the

healthy and nerve-strong,—at once cooling and refreshing to the blood, and stimulating to the nerves and muscles.

But this advantage is entirely lost the moment, when in one form or another, we use sweets as the major ingredient in elaborate food mixtures, or at the end of a dinner when the stomach is already overtaxed and in the stress of a laborious digestion. The unavoidable fermentation, due to the action of the sugar on the incongruous mass, will subvert the gastric process from a field of digestion into a field of decomposition. And here is where the force of motive, as applied to diet, has a life-and-death wielding significance. For the question which in this relation is all important lies in its ruling motive, whether we employ sweets as a means of strength and utility, or merely for the gratification of an abnormal, uncontrolled, purposeless and reasonless craving for sweets, mostly to the menace of health, strength and usefulness.

To be safe in employing free sugar as a means of food, another fact must be considered—the fact of quantity—excess. Even if the combinations are guarded, the introduction into the system of more sugar than the system can assimilate, means eventual physiological disaster. If cane sugar is not

assimilated,) and when used to excess, assimilation must always be faulty) it passes unchanged through the kidneys and remains in the system as a poison. The complications arising from such a course of malnutrition, not only requires an extra amount of work by the system but demands the vitally exhaustive secretions of certain "defensive ferments," to serve as a "body guard" for the isolation and deportation of poisons afloat in the circulation. Hence so far from being a source or means of energy, sugar under such conditions, becomes a factor of decay and degeneracy. On the other hand the degree of digestibility of pure sugar when consumed in moderate quantities, and guarded from admixtures with other food stuffs, especially starches and proteids, is very great —amounting in the healthy stomach to over 90 per cent. However it must be recognized, that it is this high nutritional percentage of the sugar that renders its admixture with nitrogeneous substances dangerous, as the readiness of the sugar to be assimilated retards the assimilation of the heavier proteids, such as beans, peas, meats, lentils, etc., which in consequence are retained in the system—unused and unusable—to be treated and disposed of as poisonous waste.

Guided by these facts, we are more

capable of determining the true position of sugar, both as to quality and quantity, in our daily diet. Its power to retard and even to arrest the digestion of proteids and starches, should give us a reliable clue, as to conditions, making sugar a safe and healthful part of our foodstuffs. Its work in the body is to release muscular energy, and to give explosive force to functional levers. It is this character of being a mere extract that renders sugar incapable in any direct way of mending a single muscle. On the contrary, if used in excess, it may not only burn up the muscle by the very explosiveness of its liberated energy, but even cause to be retarded the assimilation of the very substances, the proteids, whose function is to generate and repair muscular tissue.

FOOT NOTE.—The employment of sugar in the preservation or seasoning of fruit has a logical and hygienic basis in the fact that sugar is a natural ingredient in fruit, being one of its main and vitally indispensible elements. With perhaps the exception of the lemon, all full-grown and perfectly ripe fruits are sweet and congenial, both to the palate and to the gastric juice. When on the other hand, the fruit has had an incomplete ripening owing to insufficient exposure to the sun, or to excess of humidity in the air or soil, etc., or perhaps in most cases to a premature picking, its acidity has had neither the time nor conditions to accomplish its evolution into a natural sweetness. To avoid the corrosion which this unmodified acidity may have upon the lining of a sensitive stomach and intestine, it may be advisable to artificially increase the sugar percentage of the

fruit, preferably by cooking. This sweetening of the fruit tends to balance up its deficiency of sugar, and by a neutralization of its acidity, bring about an arbitrary, though, under the circumstances, hygienically defensible ripening.

CHAPTER XI.

SUGAR THE EXPLOSIVE FORCE IN THE HUMAN DYNAMO.

From this, it is evident that though sugar is vitally important as a source of dynamic energy, its abuse or excess is wrought with mediate or immediate disaster. If, by way of illustration, a live wire is permitted to stand for a nerve, and the glow of the electric lamp represent the phenomena of life, so the sugar in our simile, would occupy the position of the electric fluid, sweeping through the conduits of the nerve as a form of vital impulse. And furthermore, as the electric current in its discharges, so far from repairing and replacing the worn out wires, by its very nature becomes the cause of their breakdown, so the sugar by its very character as force, in place of regenerating or repairing the engaged muscular tissue, is using it up as an inevitable consequence of its activity. An excess of sugar in the diet must therefore, sooner or later lead to premature physical weakness and breakdown.

From this it naturally follows that the muscles first to suffer from the excess or

force would be those on which the individual most depends in his specific work and vocation in life. Thus we find that the college students or school children, whose eye muscles are under a constant and concentrated strain, if indulging excessively in sugar, are liable to suffer premature senility in their power of vision. The enforced action of the optic nerve with its response in the orbital muscles, demands for the repair of the latter a correspondingly increased supply of blood. Surcharged with sugar, however, the blood will become a field of combustion for vital batteries, which in place of building up the worn out muscles will hasten their breakdown. The increasing percentage of eye-glass wearing children in our public schools testifies abundantly to the sad havoc played by the excessive consumption of sugar, in young and old.

Now on the other hand, if the percentage of sugar solution in the blood is below the normal, and the muscles in consequence receive insufficient supply of energy to form an adequate basis for the finer functioning of an evolutionally advancing nervous system, the latter for its maintenance requires an extra supply of sugar. One of the causes for an inadequate supply of sugar in the blood may be found in the hyperacidity of unripe

fruit in which the acid, owing to its insufficient sun exposure has failed to be converted into sugar—a fact which gives to the sweetening of fruit a hygienic defense. Owing to the insufficient light and heat of the sun to accomplish a perfect ripening of the fruit, the incomplete saccharization of the latter demands a supply of sugar equalizing the lacking percentage. The taste of the normal and healthy individual, if carefully and self-masterly trained, may in most cases be dependable in determining the amount of sugar, needed to complete the sugar standard of any particular fruit.

However, there can be no generalization with regard to standards of diet. Each individual must be prepared to work out his own standard of diet in accord with the dominent key of his constitutional peculiarities. Some people find in the fresh, ripe fruits and grains all that is required to satisfy their nutritions needs, while the consti tution of others make positive nutritional demands on the heavy proteids.

As the geographical position of the countries approach the tropical latitudes, where the fruit receives a complete ripening, the natural sweetness of the fruit requires no addition of sugar to become a perfect reliable source of health, strength and effi-

ciency. The factor of individual health and predisposition, however, must never be disregarded in matters of diet. The nervously high-strung, and delicately organized individual, must be especially careful in avoiding any excess in the employment of sweets. A large percentage of nervousness, without doubt is due to the surplus of sugar in the diet of the sufferer which burns and explodes in the conduits of the nervous system. A prompt elimination of sugar from their diet should be the first act toward the re-establishing of a proper balance between energy and substratum; between the levers of muscle and the pressure of force in the system.

CHAPTER XII

CAN SUGAR ALONE MAINTAIN THE EXPENDITURE OF MUSCULAR LABOR?

In the laboratory experiments by Prof. Vaughan Harley, Dr. Alphonso Mosso and other investigators, it seems to have been brought beyond the reach of doubt that the muscular energy released by the consumption of sugar surpasses the effect of any other food stuff. Prof. Mosso, in his work at the Royal Laboratory of Physiological Research of Italy, has proved by a series of experiments that 3 or 4 ounces of sugar, taken an hour or so before 6 p. m.—the time for the cyclic oncoming of systemic fatigue and consequent need of rest,—has the power to practically recharge the force output of the entire organism. As if touched by magic the individual bounds into the possession of new energy, restoring his flagging muscles into a sense of undeminished vigor, without having to take recourse to any form of rest or relaxation, while continuing the work to the end of the experiment.

Similar conclusions have been reached by

Dr. Schumberg in his experimental work in Prof. Zuntz's laboratory in Berlin, Germany, in collaboration with Dr. Longmeyer and Prof. Stockvis, of Amsterdam. On a diet of 500 grams of sugar dissolved in water, a laborer was able to perform the same amount of daily work as if fed on an ordinary mixed flesh diet. Applied to the German Army, it was further demonstrated that the soldiers could endure exposures in marches and field maneuvers, otherwise unendurable, if some 70 grams (about 1-6th of a pound of sugar were added to their daily rations. Taking every condition and exigency of the test into consideration, it stands as a positively ascertained fact, that sugar, at least during the length of time covered by the experiments, is capable of supplying the muscular expenditure of energy involved in standardized physical work, without the assistance of a starch or proteid dietary.

Instructive and interesting as these experiments are, they fail however to touch the real, vital points of the problem. So far, the whole series of experimentation has only reached surface results. Here as everywhere, science has given way to theorizing, allowing generalizations to serve as standards for permanent and enduring elemen-

tary facts in human physiology. While the theoretical fact that 7.5 ounces of sugar dissolved in a pint of water can sustain the muscular strain and nervous expenditure involved in a day's physical labor, the argument has failed to consider the extremely important roll occupied by life itself in its organized expression. If man were a mere machine, his upkeep on standardized weights and measures would easily be made possible. But being a living, intelligent entity, individualized and poised to vital and mental impulses, his relation and response to fuel, as values of dietetics, must be measured in terms of qualities rather than quantities. The generalization of individual standards of life has always remained the greatest foe to deeper and truer conception of the true needs and necessities of life.

Foods have their vital values revealed not in the chemical retort of the laboratory in its base or acid reactions, but in their relation to the rythmic flow of individualized life. For after all, it is the rythmical adjustment between the vital principles contained in the natural foods, and the specific receptivity of the cell-lives or cell-organisms of the system, that lies back of and gives destiny to the entire physiological or biologic being. The chemistry of

the laboratory is a crude, hap-hazard proceeding, compared with the chemistry of the cell-life. The essences or forces that fundamentally and essentially build up the body, are principles rather than elements; the effluvia or ionic discharges of foods; as vital force, rather than of foods as molecular structure.

This brings us back to our original position with regard to sugar. As an extract the latter constitutes a mere means or method of expediency, toward the artificial improvement of fruits where a delinquent Nature under the strain and stress of contrary environment, fails to ripen and mature. Consequently the addition of sugar to fruit is hygienically legitimate, only to the extent that climatic or environmental limitations have interrupted nature in bringing her creative labors to an ideal finish. Consequently it is only in regions where nature is thus handicapped, in the temperate and arctic zones, that cookery may be tolerated to round out and equalize natural deficiencies in the sugar percentage of the fruit. And while extractives, preserves and general admixtures of free sugar in food preparations, have their values as expediencies in the economy of human nutrition, relative to imperfectly matured fruit, yet it must

never be forgotten that it is only in submitting to the weights and measures used by nature in the preparations of her articles of diet, that we find the true course to attain a higher and a highest standard of human efficiency, and that the closer we observe nature's elemental balance, the safer are our guarantees for a long and useful life. Only where Nature positively fails has man the right to step in with his artificial methods and attempt a completion of her foreshortened aims.

But when this sweetening process is extended to food-stuffs whose composition, complete by itself, makes no constitutional demand on an increased percentage of sweets such as starches, vegetables and cereals in their various forms of mushes and pastry, etc., the matter of sugaring our food-stuffs takes on an altogether different aspect. In this case, the science of nutrition can offer not a single logical argument in its favor. The direct and immediate objection lies in the fact that the digestion of sugar proceeds at a far quicker rate than that of starches and proteids, and consequently, if taken in excess, will over balance the systemic demands for sugar and at the same time over tax the power of the liver to convert the mass of saccharides into glycogen.

To save the liver from breakdown, nature is obliged to revert the method of her normal functional industry and to permit a larger or smaller percentage of the sugar to go nutritionally unchanged into the field of excretion—a delinquency that spells an unusual taxation of the excretory organs, especially the kidneys, and eventually followed by their gradual weakening and collapse. Furthemore, the undue stimulation of the system itself, must, by the very nature of the disturbed nutritional balance, lead to an ultimate, though remoter breakdown.

Nature is safe and reliable only to the extent we accept her fundamental, life-sustaining propositions, and fall in line with her rythmic sweep of law. There is an inner vital, subjective—if you please— correspondence and reciprocity between the needs of the creature and the supply of creation, which, applied to individually specified existence in its original unbroken purity, stands for an instinctively recognized urgency of a cell, or group of cells, towards replenishment from a given class or species of food stuffs, conditional to a harmonious, beautiful, strong and useful development of the entity.

As a sum total of the experiments carried on in the various laboratories and experi-

mental stations throughout the world, concerning the character of free sugar as food, we find the following statements as generally accepted points of argument.

First—When the organism is adapted to the digestion of starch, and there is sufficient time for its utilization, sugar has no positive advantage over starch foods in supplying muscular energy during a protracted period of labor.

Second—The positive advantage of sugar over starch lies in the fact that it furnishes the needed carbohydrate material for organisms that have as yet little or no power to digest starch. Consequently in the extract or free sugar, obtained from milk (sugar of milk) the infant has a valuable asset in the composition of his diet.

Third—In time of great exertion and under the strain of exhaustive labors—childbirth may be counted as one—the rapidity with which sugar is assimilated gives it certain advantages over starch. Its rapid conversion or translation into heat or energy creates a flush of exhilaration and sense of available strength, which may suffice to carry the individual over the critical moments of stress. It is this rapid-firing power of the sugar with its swift systemic invigoration that makes sugar so highly relished

by people of high-strung, emotional and nerve-exhausting temperament. It is this quality of force in the sugar which is instinctively recognized and coveted by the nervous, the irritable, the mentally strenuous, whose main expenditure lies in loss of energy. The use of free sugar when applied to sluggish currents of energy in order to force them into higher levels, has a striking similarity to the starting of a quick fire by throwing a piece of cotton or a measure of coal oil into a stove. The evolution of heat is instantaneous, but of only passing permanence: while the injury wrought to the stove by a possible explosion may be permanent. On the other hand we can readily see, in the light of this illustration, how, by using sugar in order to modify the hyperdacity of imperfectly matured fruit, we gain the same advantage as by using some igneous material in connection with, and to the aid of, the slow combustiveness of green or incompletely seasoned fire-wood.

CHAPTER XIII

SUGAR AS A FAT-FORMER

When used to excess, or to an extent exceeding the power of oxygen to convert it into energy and heat, the sugar may solidify in the muscles and form fat or adipose tissue —a process which, being the output of an incomplete oxygenation, must, from a strictly physiological point of view, be regarded as a degree of tissue degeneration. Within certain limits, however, fat is a food material, stored up in the system for future use, either to be burned into muscular energy, or used as a non-conductor for the conservation of systemic heat. And it is this quality of being an absolute non-conductor of heat that makes it possible for the system, through its fatty tissue, to maintain its normal constitutional heat, and to prevent it from being dissipated into sub-normal temperatures under the sapping influence of exterior cold.

So far, so good. But if the fatty solidification is intensified by an excessive sugar consumption, proceeding at a rate beyond the vital needs and conditions of the system, and an insufficient access to oxygen fails to

completely energize the mass, fatty degeneracy with all its sluggishness and inertness of tissue function must follow as a natural and inevitable consequence. From being a non-conductor of heat the accumulating fat becomes a non-conductor of life, and the organs imbedded in its degenerate tissue become more or less isolated from the current of vital electricity normally polarizing the organism. The various ailments known as fatty degeneracy of the heart, waxy kidney, fatty liver, etc., indicate the gradual surrender of the system, function after function, to the isolating, deadening effects of the accumulating adipose masses, walling in by insiduous steps the entire organism. And here again we are brought to face the old stern, inevitable problems of life as contained in the philosophy of excess and balance. In other words, the very agent which, when employed in accord with physiological laws, as expressed in terms of demand and supply, and under the sway of moderation and self-control, is productive of health, energy and power; if used in excess, and in slavish submission to cravings and morbid appetites, subverts the direction of the entire vital process,—overpowering by its death-weights the very levers of life which normally move in rhythmic response to the sweep of mighty,

evolutionary forces. Or again, the same element—sugar—which, when enjoyed in moderation, releases the muscular coil of high nervous efficiency, if used in excess of need, closes the coil into a life-strangling, muscle-withering, fatty degeneracy. Moderation and excess, whether in regard to sugar or any other form of food or stimulant, constitutes the two ends of the balancing scale of health and life, of which the rising of the one, corresponds, with unfailing surety, to the lowering of the other.

Furthermore, in the course of an excessive consumption of sugar, when the system has become over-stocked, not only with glycogen, but also with fat, the nerves, engaged in the production and fixation of the latter, become overtaxed, and lose their power of sustaining and vitalizing the overbalancing mass of adipose tissue. As a result, we have disintegration of the fatty structure with its subsequent organic breakdown into fatty acids; the toxic products of the bacterial invasion of the mass. Like the boomerang in its parabolic flight, the excess turns back upon itself. The gluttonous individual is forced to disgorge his nutritional overplus, and to return to nature his illegitimate gains. The microbe, the biological Nemesis or elemental adjustor of the organized universe,

has come to break down his storage vaults and return to their appropriate places his ill-gotten treasures. The fastidious glutton, violating Nature's sacred (because trusted) proprietorship, by indulging for his own selfish gratification in the fruits of her labors, devouring in wanton excess the bounties of life prepared by the great universal Mother for the joy, strength and usefulness of her children, stands powerless and forlorn in the wrecks and ruins of his own making. With his digestion ruined from repeated dietetic outrages, the man is famishing in the midst of plenty, while facing the unescapable dead-sea fruits of premature senility, functional collapse and social worthlessness.

It is the old futile attempt of egotism and wanton self-indulgence to hold up Nature's vital express to appropriate the gifts intended to be placed upon the altar of love and usefulness. In a moral universe every break of law, every infidelity in our attitude to trust and service, every excess or waste in our economic relations to life and nature, must sooner or later reach its point of limiting recoil, where the forces of a law-governed, but trespassed evolution return over paths of inverted progressions, to re-establish peace, equity and moral poise between the individual and his deserted field of duty and usefulness.

CHAPTER XIV

SUGAR AS A FORCE

It is as a generator of fat and energy that sugar, without being a proteid, or muscle builder, holds the claim of being classed with foods.

For in its normal state, fat is as important for an adequate discharge of functional life as is the striated or non-striated muscle. Without its proper insulation by the fat capsule the muscle would at once become exposed to nervous deflection and exhausture. Fat, as already shown, is a form of carbon—the end-product of sugar, not being used up in the generation of energy. Hence, sugar, in its natural form, performs a highly important role in the human nutrition, and is indispensable in a diet which aims at highest individual health and usefulness, mentally as well as physically.

Yet sugar is a force rather than a food. For if by food, we understand an impulse of life, manifesting as a concrete substance, capable of constructing and repairing the levers and pistons in the organized movements of entities; then, with force we mean

the energy by which these implements of life are brought into positions of leverages and mechanic displacements. Essentially, however, foods and forces may be regarded as the same thing, differing as quantities only, not as qualities. All foods are forces, but all forces are not foods. A force is the quintessence or attenuation of food—the concentrated, intangible charge of the essence of organized and organizable substance. In the evolution of food into force, Nature takes a step from the concrete and measurable into the abstract and illimitable. As a fat former, sugar is food; as an energy producer, it is a force. Food and force are the two main departures in the generation or evolution of a substance. But there is still another departure (for in the elemental changes of things there always appears a third)—the poison! These three steps, or departures, in the evolution, or devolution, of nature, correspond irrisistably to the old Hindoo conception of a metaphysical "trimurti"—the Brahma, Vishnu, Shiva; the Creator, Preserver and Destroyer; the Food, the Force, the Poison.

CHAPTER XV

SUGAR AS A POISON

An impulse, imparted to the human system, either mentally, morally or physically, if congenial to its general vital functions, and in synchronous relation to its rhythm as organism, covers our conception of food, whether it be enjoyed by the body, mind or soul. Food imparts no shock to the system, introduces no uncongenial changes, but maintains by means of repair and preservation, an unbroken serenity, and a progressive balance of individual unfoldment.

Now as long as the rhythm of this vital impulse remains synchronous and harmonious to the constitutional key-note of the system, the latter responds by raising its cellular and functional activities to an ever higher level of efficiency. In other words, that though the vigor and vitality of the system have thus become intensified, and the vital exchanges made to proceed at a greater rapidity, no incongruous or disturbing element in the form of artificial stimulant has been thrown into the balance of the constitutional rhythm. In a word, food,

in its congenial, rightly combined relations to individual needs, is translated by the cell into a vital force, which raises the entire organism into constantly increasing refinement and survival value.

But if the vibrations of the new impulse have been inharmonious to the evolutionary order of the system; if the incoming current of vibrations has struck it at an angle in opposition to its constitutional plane of progression, there ensues a clash in the contact. The rhythm of the system, involving the entire commonwealth of its cellular exchange, is ruptured, and in proportion to the degree of rhythmic diversity of the two planes, is the severity of the shock. The alien impact may strike the system with the demolishing force of a tornado. The cell organisms become dazed; their functional activities subverted; the net-work of nerve connections torn and disordered; and the entire vital structure totters like a wrecked and stranded vessel. The elemental antagonism of the substances involved in the contact, subverts a living force into a death-dealing poison.

A poison, scientifically defined, is thus a force proceeding in its action along a different scale of vibration than the system into which it has been introduced. From this it

follows that a poison may be rendered harmless, either by subduing its rate of vibration through a process of neutralization, or by a reinforcement or intensification of the vitality of the system under attack. If the poison can be leashed to the rhythmic order of the organism on which it has a hold, its force is broken and the peril averted. It is on this principle that the standardized antidotes exert their saving qualities; they either adjust the system to the force, or the force to the system; they either subdue the poison, or reinforce the organism.

According to its manner of treatment, sugar may become the one or the other of the above aspects; in its combination in the ripe fruit or vegetable, it is a food; in its "free' or extracted form, it is a force; in its decomposed state as "organized" acid, it is a poison.

CHAPTER XVI

SUGAR AS A MEDICINE

Owing to its concentrated form, sugar is at once a great antiseptic and a glandular excitant. The basis for this quality lies in the fact that in its extracted condition it has an elemental hunger, or chemical affinity, for every substance or essence from which, by the very fact of its extraction, it has become separated. Its artificial state, as "free" sugar, turns it into a sponge of suction, ready to absorb any element from which, as compound, it has been separated. It is from this ruptured elemental balance that sugar derives its quality as medicine. Mixed with lard and melted in a vessel over a slow fire, sugar becomes a valuable salve, which, if spread over a wad of sterilized cotton, and applied over the surface of any inflamed interior structure such as the ovaries, tonsils, testis, lymphatics, etc., will absorb the urates, carbonates, and other kindred toxins accumulated in the diseased tissues. The oxygen of the sugar will oxydize and burn up the poisons, retained and crystalized in the involved congestions. The

broken-up indurations are then readily eliminated by the blood current through the various organs of excretion.

In corroboration of this fact, the late Dr. W. H. Burgess, of Chatanooga, Tenn., has found that a teaspoonful of sugar, held in the mouth for a period of five or ten minutes and then expectorated, if repeated two or three times on an empty stomach, will drain the glands of the head and neck from the poisons active in neuralgia, catarrh, deafness, bronchitis, pharyngites and the various forms of sore and swollen throat. Dr. Burgess even seems to have reason for believing, that this "sugar cure" has power to influence more or less every organ and tissue of the body, even as remote as those of the abdominal cavity and the pelvis.

In this power of the sugar to absorb, by and through its vacuated carbon, the various toxic acids that poison the cells of the system, *Materia Medica* has found an immensely valuable agent in its work of restoring health and strength to broken-down tissues. Its action points out the moral of nature, the fine irony of universal law, compelling the individual to retrace his steps in evolution and restitute his ill-kept vital records. The same force in sugar which as an object of over-indulgence wrecks him, will, when sub-

jected to self-restraint, bring him back his lost estate of health. The acid of the sugar incarcerated the man, its vacuated carbon again released him. This gives to the sugar a new meaning—that of life-saver. From being a means of gustatory irritation and gluttonous appeals, it assumes the position of a remedial agent of most far-reaching therapeutic power. Reports of clinical experiments with regard to the therapeutic value of sugar, are constantly increasing in the medical publications. Prof. Dingle, the famous London specialist in disorders of the heart, reported quite recently in the *British Medical Journal* of a case in which the mitral valve had been damaged by over-exertion. Owing to the subsequent insufficiency of the heart-muscle to perform its role in the circulation, abnormal fluids had begun to collect in the abdomen to the extent that tapping had to be resorted to repeatedly. Every remedy within the reach of experience having failed, solutions of sugar was tried of one ounce five times a day. After three days' treatment the tapping was no longer required, and the increase in health and strength, following upon the new treatment, suffered no relapse up to the date of the Professor's report. A clinical feature of great significance was the heavy increase of urates

and oxalates, the physiological ash or oxydates, resulting from the action of the sugar on the tissues, its carbon absorbing the organized acids and thus breaking up the toxic compounds, accumulated in the system through the weak circulation due to the insufficiency of the heart.

Similar reports have been made by Dr. Hausch and Prof. Behrend, of Berlin, Germany. Patients suffering from general debility have found in a judicious administration of sugar a new source to energy and health. In most cases, however, the sugar solutions are medically prepared and administered hypodermically, as ordinary cane sugar is found to be incongenial to the assimilative functions. Often a large percentage of the sugar was found in the urine, eliminated from the system by the kidneys. An incident which may shed some light on the subject of sugar therapy is reported from a hospital in Edinburg, Scotland, where a patient afflicted with a severe attack of rheumatism had been advised by his physician to "cut out" sugar from his daily ration. In consequence the rheumatism was duly cured, but in the course of time, symptoms of general debility and nervous breakdown began to show up. In his distress he returned to the hospital and asked his old

physician for advice. Connecting the discontinuation of the sugar with the new development, the physician allowed him experimentally a certain amount of "free sugar" daily. The patient showed signs of recovery from the very start, though the report did not include the fate of the kidneys, and the subsequent return to the old rheumatism.

These various case reports are in perfect accord with the philosophy of sugar as set forth in this volume. They all go to show the effect of sugar on the human system of nutrition. It is in the very fact of "free sugar" being an abnormal substance, that i has its value as medical agent, and which on the same time distinctly and unmistakably points out its proper place in the human dietary. For while its action as a chemical absorbant is of the greatest value toward the breaking up of accumulated tissue poisons in the system, yet its further actions on other body tissues, viz: kidneys and liver, may and does give rise to remoter complications. The safer way in employing sugar as medicine is to limit its application to external tissues. The transit form sugar as force, to sugar as poison is obscure and indeterminable, and safe only under the guidance of the light of painstaking scientific experimentation. The very allurements connected

with the taste of sugar should accompany its employment with a double caution, a scrupulous restraint in its indulgence, either as food, as force, or poison, and only with a motive of health and general usefulness.

CHAPTER XVII

THE MORAL APPLICATION OF "FREE SWEETS"

The extracted or concentrated form of sugar which we term "Free Sweets," stand in the same relation to the physical world, as temptation and the dead-sea-fruits of gratification, stand to the moral world. Either of these forms of sweetness, when in excess, turn readily into the general acidity of disgust and pain, physically and morally. On either plane the action of "sweets" is to break up fixed compounds for the reorganization of the new ones, which may either be higher or lower types of life, according to the motive, character and degree involved in the indulgence. Thus temptations may be called "moral sweets," which if extracted or rendered "free," i. e., indulged in for its own sake, will produce the same effect on the individual's moral nature as the indulgence and excess of "free sweets" on his physical nature: the break-down and dissolution of substances and principles in a swifter ratio than the vital constructive forces of his system can replace. By a

recognition of these principles we are able to apply them as practical solvents to the problem of human life.

As already pointed out, the "sweets" contained in the natural products of evolution in the fruit, grain and vegetable, are indispensible in the work of dissolving old, used-up, and decomposing cell-structures in the system. Applied to morals this means that the sweets contained in the soul-trying events known as "temptations,"—if countenanced and treated with the temperance, dignity and moral restraint as expressed in self-control, will generate those changes in the human mind, and introduce those assets of self-conscious experience and knowledge, which are back of and give rise to the formation and growth of character and manhood. And furthermore, as pathological changes, and subsequent breakdown of body tissues, are due to excessive indulgence in extracted or "free sugar;" so in a sorresponding way a mental and moral breakdown, with subsequent decay and dissolution of character, is the inevitable outcome of an indulgence in the "free sweets" of the moral plane. For what is immorality but the extract of natural events: the giving up to self-gratification, with the subsequent surrender of an individual's moral nature to soul and character-dissolving forces.

CHAPTER XVIII

EVIDENCE FOR AND AGAINST THE USE OF SALT

In the strong search-light which the chemistry of an advanced physiology sheds upon the subject of diet, old, time-honored standards are breaking down to give way to a new conception of the quantitative and qualitative values of digestion and nutrition.

Among the prevalent objections to the use of salt is the tendency of the latter to crystalize and cause a hardening and stiffening of the body tissues. It is alleged that salt, being a mineral substance, is impervious to the action of the digestive juices, and hence becomes an encumbrance or preventative in the digestion of salt-cured foodstuffs. Furthermore, as salt is a mineral, and as such unassimilable, it must be suffered to remain in the system as a foreign body, deposited in the capillaries in the form of crystalizations, and constantly threatening the individual with a hardening and rupturing of his vital tissues. The final outcome would be some type or other of Arterosclerosis, Bright's disease, Arthrodial Rheu-

matism, etc., or at its best premature old age.

In a recent publication of Dr. Willamer Stephanson,—the discoverer of the white Esquimaux, new arguments have been added to the above claims against the safe use of salt in the dietary. Dr. Stephanson, as a result of his experiences in the Arctic, considers salt as a positive hindrance to life. He describes its action upon himself and his followers as a narcotic poison, and found its use absolutely eliminated from the dietary of the Esquimaux, who would rather submit to the ravages of starvation than to use food cured or seasoned with salt. On the basis of this data, Dr. Stephanson draws the conclusion that sodium chloride—our common table salt—is incongenial and harmful to the system, and its use in the dietary of the civilized races, a grave physiological error. Like tobacco, he says, salt has conquered our taste and instinct by the unnatural craving created by its indulgence as a stimulant, resulting in a habit difficult to break away from. "Among the uncivilized Esquimaux," he tells us, "the dislike for salt is so strong that a saltiness, imperceptible to me, would prevent them from eating at all." In connection with these observations he refers to fat as

more agreeable to his taste than any other form of food, including meats and cereals. The Doctor at last gives as his firm conviction that salt is inimical to the pursuit of life and health, and advocates strongly its removal from our diet.

Over and against these arguments, the advocates for the use of salt refer to its traditional recognition among all nations, and during all times and ages. The appellation made by Jesus to great characters, as the "Salt of the Earth," has been referred to as an evidence of the high opinion and universal recognition in which salt was held by the ancients. In the records of the old Norse people, as far back as in the Edda, reference is made to salt-cured meats; and in ancient Egypt and Greece, salt was regarded as an indispensible article of diet. Among the modern nations few people employ more salt-cured meats, and especially fish, than the Scandinavian. As regular as Scotchmen take their oatmeal, and the Americans their Parkerhouse rolls and coffee to break their morning fast, the Scandinavian laborer takes his salt-cured bloater and black bread to start the course of his daily diet, which in the course of the day is to be followed by a noon meal and supper of additional salt meat or fish, boiled or fried. With few

exceptions the meat diet of the farm-hands and city-laborers of this time—and history-honored pennsula, consists of the preserved and pickled varieties, the year round. And yet their physical endurance, digestive power, and efficiency as laborers seems to suffer in no way from this dietetic excess of salt.

Even in lands where natural barriers have isolated the people from the ways and habits of culture, such as inland China, the Russian Steppe, primitive North America, Australia, etc. with all the radical differences of the natives in other respects; with regard to salt, their taste-buds are all uniformly developed. The unique craving by these nature-children for a substance, in spite of its alleged unfitness, not to say dangers, to health and life, remains an inexplicable and incongruous fact in the scientific theories of the modern food-reformer.

Nor is this instinctive craving and relish for salt limited to the human species; it is distinct both in the wild and domesticated animals. All throughout the arid regions of the temperate zone, are found what are called "deer licks"—deposits of rock salt—where cattle and horses, often after miles of trailing, come to enjoy a good old time, licking salt. Recognizing this peculiar craving in the animals, the farmers in the northern

countries, where cattle have to be kept indoors on dry fodder during at least half of the year, have a custom to occasionally supply their stock with salt, which, by the latter, is always eagerly looked for. Besides a general functional sluggishness and loss of appetite, the animals in the absence of salt, manifest their need of its stimulation in a lessening, both as to quality and quantity, of their daily output of milk.

What, to the naturalist, stand as mere interesting traits, become, to the student of biology, factors of great scientific significance. Thus, Dr. Barriere, of Lyons—a rising French scientist—has found reasons to believe that the entities of evolution are not only identical as to the *character* of their origin, but also as to the *place* of their origin. According to him, the cradle in which organic life found its first receptacle was rocked by the waves of the ocean, and its archaic cradle-song wrought in the treble clef of singing waves. "The primitive life," says Dr. Barriere, "which in Genesis is called the 'Spirit of God moving upon the waters,' sprang from the single cell. And this cell, vegetating in the plant or the animal, is continually bathed in a fluid, which, whether in the form of lymph, blood or vegetable sap, differs in no essential way from sea-water."

Similarly, Prof. Jacque Loeb, of Chicago University, finds in saline preparations a most miraculous power to influence and promote the progress of life. In his albiogenetic and parthenogenetic experiments he suspends his unfertalized eggs for about two hours in a solution of 100 c. c. sea-water, which effects changes in the albumen of the eggs, leading up to the formation of the ominous membrane with its gelatinous zone, which constitutes the physical condition for fertilization and the biogenetic drama, which has its termination in the phenomena of cellular mitosis.

No less argumentatively strong for the power of salt to influence vital processes, is the fact that a saline solution, injected hypodermically, is able to substitute, or replace, the loss of blood in an animal body to the extent of sixty per cent of the entire blood volume. Nor can we ignore the numerous cures effected by mineral hot springs, especially in Germany, where immense crowds of people gather every year to regain their shattered health from the power of iron, sulphur, sodium or magnesium salts—by which the waters are charged. Medical practice is not at all uncertain as to the power of certain mineral salts—viz., Mercury, Potassium, Sodium, etc.—to check, after a few

doses, the ravages of syphilitic infection; while, on the other hand, the very power of mineral poisons to arrest vital processes is in itself an evidence of the power of these poisons to enter dynamically into the very sanctum sanctorum of cell life. For the power of destroying life demonstrates the active presence of an influence which is no less deep-reaching and effective than the power of generating life. Hence, the defenders of salt in its general usage, have certainly recourse to powerful evidences, not only for the possibility of saline absorption and metabolization in the human body, but also for its qualification to meet a strong vital need.

CHAPTER XIX

THE FUNDAMENTAL BASIS OF SALT

Then, after all, what is salt? Whence its origin, its powers, its necessity? Is the nature of salt in any way—and if so, in what way—conditioning the evolution and the maintenance of life on this planet?

In the chemical formulary salt is defined as an oxidation product arising from the action of oxygen and hydrogen on a metal. At the encounter of the two elements on the field of a mineral substance, the latter gradually yields to the attack and decomposes in the form of rust. This rust is the mineral ash, remaining as an end-product of the decomposed mineral elements, after the cohesive force back of its characteristic groupings of atoms is set free.

Oxygen and Hydrogen are the forces of breakdown and renewal, employing elemental affinity as their levers or agencies of action. Thus, salt may be the end-product of multiple elemental decompositions, obtaining its name and characteristics from the two or more minerals involved. Hence, in a combination, let us say of Magnesium and Sul-

phur, the oxidation product becomes the familiar Epsom Salt (MgSO4). If the field consists of Sodium and Sulphur, the result of the combination is Glauber Salt (NaSO4). If it be Sodium and Borate, we get Borax (Na2B4O7), etc. Finally if the combination is Sodium and Chloride, the output is our familiar table condiment—our common salt (NaCl), Socium Chloride.

CHAPTER XX

SALT AT ONCE A PRESERVATIVE AND A DESTROYER

It is the peculiar origin of salt, arising as it does from processes of decomposition and disunion, that accounts for its subsequent influence on the composition of the organic or inorganic substances on which its influences is brought to bear. A duality in its composition, the very nature of salt is at once to preserve and to destroy, to condense and to evaporate; with one arm producing and with the other reducing—centrifugal in its atomic action, and centripetal in its moleculer.

Now the basis and the perpetuity of form lies in the undisturbed rhythmic interaction between the intrinsic and extrinsic properties of any substance. A change in this rhythm, due either to internal or external interruption—thermal, mechanical or chemical,—by disturbing the molecular balance of the compound, invites the dissolving attack of the hydrogen-oxygenions. A fissure or crannie in a rock provides at once an opportunity for this dissolving elemental play.

And the rusting away of a metal, or the crumbling away of a granite, display, concretely, the processes of dissolution and resolution engendered in the respective substances. Like the microbes entering the field of a disturbed physiologic rhythm in the lungs of a consumptive proceed to disorganize and remove the ruptured tissues, so the fiery attack of the Hydrogen-Oxygen ion on the exposed substance of a fissured rock, starts a process of dissolution which sooner or later must involve the reduction of a solid granite boulder into a vitrious, formless mass—the ash of combustion with its resultant inorganic salt. The evolution of water, present in the moisture of vapor, accompanying all combustion, organic or inorganic, reveals the identity of the engaging elements. It is a metamorphosis of the atoms of the temporarily divorced Hydrogen-Oxygen combination, reappearing in the ensuing water molecule, H2O—the type of universal equipoise—after having spent their excess of chemical energy in the attack. For it is this exhausture and subsequent loss of identity of the elements as they disappear in the new-formed compounds, that lie at the basis of the entire chain of the biochemical phenomena of the world. As the atom of life, the biological unit, while passing through

its short cycles of formed and lost affinities, pre-figures the metamorphosis of the organic kingdoms from seed to plant and fruit, and back again into the seed; or, as in the still higher forms of evolution, from larva to pupa and subsequent butterfly,—so the atom or unit of chemistry, exhibits the same principle of evolution in the kingdom of the inorganic world. Merging its identity as atom into the compound of a new molecular body, in the course of the cyclic dissolution of that form, it is again released and restored to its elemental identity. In the chemistry of salt, the engaging elements, the Hydro-Oxygen ions, in their exhausted state are found to disappear into the compound of water, from which again, in the process of dehydralization or evaporation, they regain their original unity and elemental balance.

This conception of salt, as a product of decomposition, is borne out by every new discovery in the field of chemistry. For what are the radio-active phenomena of the Roentgen rays, Actinic rays, Finsen rays, N rays, etc., but the incidental manifestation of an all-embracing process of elemental break-down engendered by two world-destroyers and world-rebuilders—the Hydro-Oxygen. Thus the new metal, Helium, constitutes a field of action where the ominous

Hydroxyle is at work wrecking an element the decomposition product of which, meets us in the radium salt. The quality of destructiveness characteristic to the radium salts, and often fatal to the tissues exposed to its action, indicates unmistakably its true nature and genesis. The phenomena of light accompanying radium decomposition, reveals the intensity of the elemental disintegration.

CHAPTER XXI

HOW THE PRINCIPLE OF SALT EXPLAINS THE PHENOMENON OF THE X-RAY.

The power of salt to change the constitution of substances brought under its influence exemplifies the operation of an ever-present law or principle in the universe—the influence exerted by one substance or subject over another. For the philosophy of influence is expressed in the power of an agent to impose its rate of systemic vibrations, or its tenor of life—its keynote—on any object or entity responsive to the influence. It is the functional or constitutional identification, transmitted through the power of influence, that compels one violin string to respond in consonance with another of the same tonal quality. And it is in this transfer of constitutional identification between substances, subject to each other's influence, that explains the power of salt to impart rigidity and crystalization to the substance brought under its influence, (whether it be the muscles of the butchered beef or the living muscles of the human body), if salt has been used too

freely in the dietary. In the case of radium salt a new quality is added to its influence. The immense rate of vibration characteristic to the molecules of this salt gives rise to a swiftness amounting to luminosity—a state of vibration, which, in accordance with the principle of influence, becomes transmitted to the substance on which it acts. Hence the radium salts, to the extent the different tissues respond to its vibration, gives rise to the X-ray and its phenomena of transparency. Focalized on the physical body, the substance of the latter is thrown into the radio or rhythm of the radium light itself, and consequently becomes identical in vibration with the latter:—which means luminosity. So sweeping and fundamental is this law of vibration, that its application governs consciousness itself in the power of influence exerted by one mind over other minds. The stronger mind imposes the rate or quality of its own vibration on the weaker mind, resulting in an approach to similarity or rather identity of conscious perception in form of moral or mental conviction.

Hence the same principle that lies back of the curative power of meat, lies back of the curative power of mind: it is the power or quality of one form or expression of energy to impose its characteristics, by means of

enforcing its own rate of vibration, upon a substance or subject of less power of resistance than itself.

CHAPTER XXII

WHAT THE "SALT OF THE EARTH" MEANS TO PHYSIOLOGICAL CHEMISTRY

What is the real mission of salt in the human body and in what particular processes can its beneficent effects be traced in the tissues and viscera subjected to its action? An output of disintegration,–a mineral or physiological ash-product,—the nature of salt is thus to impart its characteristic to every substance in which it succeeds generating chemical action. And furthermore, as disintegration involves a dual process: the crystalization of solids and evaporation of liquids, the condensation or hardening of the fibrous tissues of the body, with a subsequent release of its fluidic elements,–we are forced to admit that sodium chloride (common salt) occupies a high vital significance in the metabolism of the human body.

Like the sword of Mohammet, salt has a dual nature, and only through a close observation of its variegated employment as a therapeutic agent are we able to define its seeming paradoxical action. Thus, while its

effect as cathartic is due to its powers of evaporation and subsequent collection in the intestines of excessive fluids, thereby causing evacuation, so the on other hand, its reactionary influence in the hardening and ossification of the body tissues arises from the opposite phase of evaporation—condensation. Furthermore, the presence of salt in the system sets free body-serums and general aqueous accumulations in the various tissues,–a fact which explains the power of the hypodermic injection of a saline solution to compel the different body-tissues to set free any available serum, and pour it out into the general circulation. The paralized heart-muscle, reacting under the same influence, responds to the impulse, and by re-assuming its integral rhythm of expansion and contraction, starts anew the pistons and levers of the human dynamo, swinging the vehicle safely over a threatening collapse.

CHAPTER XXIII

HOW SALT CAN BE AT ONCE THE SAVIOUR AND DESTROYER OF LIFE

The constant manufacture in the system of sodium chloride indicates its elemental necessity in the economy of body nutrition. For whenever in the course of our daily diet, we introduce sodium into our system, which happens every time we eat spinach, beets, lettuce, strawberries, red meat, or any other sodium-carrying substance, we start a chemical action between this element and the chlorine contained in the gastric secretions, with the subsequent evolution in the system of sodium chloride and water, which means that hydrogen and oxygen, after having engendered the decomposition of the involved elements, disappear in the cyclic retirement of their union in the form of water. But the fact that salt, the product of decomposition, is continually formed in the system, indicates beyond doubt that as organic or inorganic compound NaCl has an important and indispensible work to perform in the generation and support of life.

Now it is by virtue of the accelerating action of salt on the destruction and displacement of tissue, that its importance in the vital processes of organized existence is especially made evident. Its power to break up fluidic and gaseous combinations makes its presence a necessary condition for the elimination from the system of carbonic acid gas, lactic, oxalic and uric acids, ammonia, and other body poisons, which, through the affinity they wield over the toxins in the blood, arrest its oxydizing and tissue-building functions.

It is the quality of salt, however, to release and set free substances that constitute its peculiarity of being at once a source of life and a source of death. For the opposite pole of evaporation is crystalization, and the drying up of a fluid naturally leaves in its place a residue of deepening crystalization. If, then, the supply of salt in the system, owing to excess in its consumption, exceeds the demand of bodily elimination, the physiological balance breaks down, followed by a progressive formation of deposits and their gradual hardening into degenerating crystalizations of muscles and viscera—conditions which we recognize as the basic pathological features in Artero-Schlerosis, Cardiac Degeracy, Renal Calculi, and the various

progressive forms of Arthritis Deformans.

It is this power of salt, at once to evaporate and crystalize, that preserves substances from decomposition and decay; while on the other hand, it is this very virtue that renders salt-cured meat difficult for any but strong stomachs to digest. For meat is preserved by the progressive release of fluids engendered by the action of salt in the tissues,–a process which proceeds from without inwardly, from the surface to the center, while isolating segment after segment from bacterial invasion.

Thus, while salt moderately enjoyed has the power to prevent decomposition and putrifaction of the tissues within or without the body, its excess on the other hand, leads to the very opposite, to the crystalization and arrest of organized life. As long as the high cellular vitality of youth succeeds in continually bursting the saline deposits formed by the ceaseless separation of solids and fluids in the growing organism, the functional integrity of the individual is secured. The balance between evaporation and crystalization in the body serum remains physical body, this process of disinfection is maintained by the action of Sodium Chloride, either generated in the system itself, or introduced as common salt by way of our daily food.

CHAPTER XXIV

WHY THE ESQUIMAUX ABHORS SALT IN HIS DIETARY

Scientifically speaking, it is the very fact that salt is shunned as a poison by the dwellers of the polar region, that furnishes an evidence for its unique and special qualities in relation to life. Hence, so far from being an evidence against the use of salt, the observations of Dr. Stephanson point to the presence of active principles in salt, which have physiological value for us to the extent we become related to them by force of our environments.

Now as means of preservation, the action of cold, and the action of salt, bring out identical results in regard to animal tissue. In either case the action, if sufficiently intense, leads to crystalization. From the foregoing we have already seen that salt, by its dual processes of evaporation and condensation, brings about a state of normal equilibrium between the fluids and the solids of the tissues subjected to its action. A deficiency of salt will lead to putrification; an excess to crystalization.

In the polar regions the function of tissue preservation is carried out by the influence of an unrelenting all-penetrating cold. In close correspondence to salt, the action of frost is characterized by outward evaporation and inward solidification. Ice by thus isolating the substances under its influence from the access of oxygen, the presence of ice renders putrifaction impossible. The preservative power of the cold storage process has its basis in this fact, which, at the same time, lies back of the preservative power of salt. In either process, we meet the dual action of evaporation and solidification with the subsequent isolation of the field of action, from the aerobic (oxygen-feeding) microbe of putrification.

Realizing that life in the Artic means a close life-and-death struggle of the individual against the crystalizing rigor of an all-piercing frigidity, it is readily seen why salt, in itself a refrigerant, must not only be superfluous to existence in this region, but add to the severity of the mortal conflict. Salt would proceed to attack the system from within, on the same tissue-shriveling, blood-coagulating principle as the intense cold from without. This again would render the struggle between the attacking and defending forces of existence altogether

unequal, and speedily exterminate every form of vegetative possibility within certain limits of standardized geographical demarcations. It is the instinctive realization of this vital fact that makes the Esquimaux close his flesh-pot to the superfluous seasoning of the salt-shaker.

The same reason lies back of the fact that there is no room for fruits and vegetables on the dining table of the Esquimaux. The Sodium, Iron and Magnesium, present in lettuce, spinach, tomatoes, etc., would solidify his blood serum into icicles. Not even cereals, with their large percentage of organic salts, can be enjoyed with safety, except as a very small percentage of the general diet. Only fat, with its absolute freedom from every reducing constituent, offers perfect assurance of a safe and wholesome article of high-arctic diet.

The same cause that keeps salt out of the Arctic keeps it out of the Tropics. The intense heat of the latter region performs the same physiological function as the intense cold of the former. In either case we find the same duality of forces with an object to render conditions suitable for the perpetuation of life—the evaporation of fluids, and solidification of solids. The swift evaporation in the Tropics of organic fluids prevents

the stagnation of exposed substances, which again precludes the generation and culture of putrifactive bacteria. The Tropics and Artics, though antipodes in climate, are identical in their principles of vital preservation. In either case amospheric conditions perfom the sme antiseptic and germicidal functions in these regions of heat and cold, as salt performs in the intermediate—the Temperate. Salt is substituted in the Arctics by fats, in the Tropics by sweets. As the former, by softening and modifying the progressive solidification of tissue due to the crystalizing action of cold, maintains the balance of life in the Arctics, so the sweets of the fruits accomplishes a corresponding feat in the Tropics.

CHAPTER XXV

WHY LIFE IN THE TEMPERATE ZONE NEEDS SALT FOR ITS MAINTENANCE

It is under the stress of this unescapable logic that in the Temperate zone we are prepared to find conditions that demand both sugar and salt for the maintenance of their physiological and biological balance. For while the cold of that region is not severe enough to accomplish the work of preservation through frigid crystalization, nor the heat intense enough to bring about the same result through evaporation, the balance of organized existence finds its sustaining agency in the free distribution of salt, both as mineral deposits and as active ingredients of plants. The number of so-called "salt licks," scattered broad-cast over the Temperate zone, provide opportunities for hordes of grazing animals to satisfy their instinctive craving for salt.

It is significant that in this Temperate zone, with its vital demand for salt, the forces of moral and mental evolution have

reached their high-water mark of expression. In this evolutionally high-strung zone of existence, bordering on antipodes of extremes of heat and cold, forces of self-adjustment are at work, which for their maintenance require the dual agency of both salts and sweets, of both vegetables and fruit. The tremendous expressiveness and versatilities of existence in the Temperate zone, arising from its necessity to deal with vital problems of every type and condition of a South and of a North, demands quick access to every means and method of unfoldment, involving needs and exigencies peculiar to every longitude and latitude of the planet.

It is self-evident that generalizations which may be logical and true, as far as they apply to the stereotyped conditions of a given zone or center of existence, must utterly fail when applied to regions where different environments and conditions of life give rise to altogether different needs and necessities. In the Temperate zone, where the general typical conditions offer the highest possibilities for physical, moral and intellectual development; where the blending of antipodal environments present the most diversified and universal demands on the individual for adequate self-adjustment, and where unique and imperative needs in the

midst of a boundless variety of supply offers an illimitable range of choice, we are entering situations of life that lead us to an evolution of free will, and to the cultural triumphs arising from altruistic motives.

Limitations in means, lead to limitations in ends, as the height of attainment stands in direct correspondence to the range of individual choice. In the frigid zone, cultural endeavors are paralyzed by the demands of life, exceeding the supply of life, and where stereotyped conditions for existence set impassable barriers for diversified individual development. In the Torrid zone the expense of individuality has been kept back by the very opposite reason—the supply exceeding the demand. In the former, life is retreating before a stimulant to which organized existence is inadequate to respond; in the latter, life sits still because there is no stimulus to elicit its higher powers of response. The one succumbs from lack of life, the other from an excess of life.

But in the Temperate zone the individual triumphs over his environments because of having powers level with his opportunities. It is not the abuse of the means of life, nor their disuse, that lead toward the elevation of humanity, but the full enjoyment of environment, while under the gauge of in-

dividual self-control. The ingenuity of man has no other source, power or inspiration than in his efforts to make opportunities out of life, and life out of opportunities. Limitations of choice mean limitations of attainments. At a certain stage of development temptation itself becomes a means of moral development, and virtue the progeny of understood and conquered vice. It is in the wrestling with vice that innocence may evolve the power of virtue. Only the freedom and opportunity of choice can open to us the kingdom and mastery of free moral will.

And it is here the Temperate zone offers us the key to destiny. Its very name brings out its quality of virtue. To live in the midst of accessible infatuations and yet remain temperate; to hear the call of wild passions reverbrate in our ear, and yet remain loyal to the "still small voice" of conscience: to use the fruits of the earth, sugar and salt, fats and acids, starches and proteids, spices and condiments, not as ends, but as means; not as slaves to enjoyment, but as masters of choice, with knowledge as guide. And as usefulness and altruism, as motives, hold the key to the deeper meaning of life, it is the Temperate zone that, in the fullest scope, brings out the material aspects and

opportunities for highest attainments. The determination of the individual to utilize, for moral purpose, the products of life, makes him the true beneficiary of the transcendal virtues.

CHAPTER XXVI

CORRESPONDENCE BETWEEN "FREE SWEETS" AND "LOOSE MORALS"

Sugar is to the physical world, what temptation and its dead-sea fruit gratification is to the moral world. On either plane the action of "sweets" is to loosen or break up fixed compounds for the reorganization of new ones; and if the process is normal and law-governed, the result will be higher, more enduring forms and types of life. Thus we may regard temptation as a "moral sweet," which, if extracted or rendered "free," i. e., indulged in or gratified, will produce the same effect on the individuals' moral nature as the indulgence in extracts of "free" sweets upon his physical: the breakdown and dissolution of substances and principles in a swifter ratio than the vital constructive forces of his system can replace. And this introduces the natural equation of the problem involved. For as the sweets, contained in the natural products of evolution, in the fruits, grains, and vegetables, are required for the dissolution of old and used-up structures in the body, so as to insure a higher

functional efficiency, so the "moral sweets", contained in the trying events of life, known as temptations, if met with temperance, dignity and moral restraint, which constitutes self-control, will generate those changes in the human mind and introduce those assets into self-conscious experience and knowledge, which give rise ro the formation and growth of character and manhood. And furthermore, as the pathological changes and progressive breakdown of body-tissues are due to excessive indulgence in "free" sugar, so, in a corresponding way, the mental and moral breakdown, with its subsequent decay and dissolution of character, is the inevitable outcome of indulgence in the "free" sweets of the moral plane. In either case it is the stimulation and gratification of the immoral impulse to yield to the bitter, unripe fruit of soul-degrading pleasures, sense-slavery and self-contempt.

CHAPTER XXVII

THE "SALT" AND THE "SWEET" OF THE EARTH

As to the moral plane, "free" sugar stands for the extracted and enjoyed sweets of temptation, with the threatening processes of moral breakdown in consequence, so in a corresponding way, "free' or inorganic, i. e. mineral, salt, stands for the preservation or fixation of character. And furthermore, as salt in its mineral rigidity, unchanged by the liberating, ever-stirring, ever-advancing forces of opposing polarities, gradually preserves and crystalizes into inanimation and death the forms and substances subjected to its action, so likewise character, if permitted to become "fixed" in its limited self-sufficiency, and kept isolated from the fresh, balancing, swelling impulses of a sympathetic solidarity with its environment, runs the risk of crystalizing into dormant, lifeless, theorizing, with its inability of vital response, its intolerance and egotism.

Applied to the moral plane, salt stands for strength of type, perseverance of effort, and immutability of purpose. Hence to deserve

the title of "the salt of the earth," means to be a moral bulwark, a self-denying, self-sacrificing, vital breaker fixed in the tumultuous sea of life; a veritable "rock of the ages," supporting by its very rigidity the finer, fluidic, progressive and exalting elements of universal life. The "salt of the earth" refers unmistakably to a phase of faith—solid, severe, unyielding—which has it enduring and redeeming virtue in personal sacrifice; while the "sweet" of the earth represents the very opposite phase of existence, the principle of ever-fluctuating, ever-soaring or sinking, ever-consumed or consuming emotion—the affections, sympathies, passions, elegies and pathos of human existence, which if divorced from the "salt of the earth" must wither in its own light, burn up in its own conflagration.

Again, narrowed down to its concrete, practical levels, the "sweets of the earth" represent the sum-total of organic acids, the fruits, etc., while the "salt of the earth," on the same basis of definition, stands for the carriers of organic salts, the grains and vegetables. The latter enter the body-metabolism as transmitters of constructive, cementing, fundamentally conserving forces; the former as an energizing, impelling, generative, ceaselessly stirring and combustive

impulse—the principle of unfoldment and growth in natural evolution. Creeping out from the soil in which it remains partly buried, the vegetable draws its energies from the mineral world; while the fruit ripening in the mid-air and bathed in sunlight and oxygen, draws its energies from atmospheric storage batteries. Thus, while the former is an exponent of the earth and its rugged solidity, the latter stands for the intangible fairy realm of light, expanse and freedom.

From this, it naturally follows that the health and fulness of physical life can be maintained only through a proper adjustment of the vital balance of organic elements represented in acids and salts, fruits and vegetables; in the elements engaged in dissolution and resolution; in convulsive growth or reactionary resistance; generative excess or conservation of species. Any violation of this code of vital ethics, any effort to compel nature to surrender her integrity for the gratification of any base or untrue appetite in man, means directly or indirectly an act of self destruction. Human ingenuity, goaded by unholy and artificial wants may succeed in extorting shocking advantages from the administrative energies of natural evolution; but the genius of retribution is continually at work, compelling the transgressor, through

the executioners of sickness and suffering, to restore, in terms of enforced personal renunciations, the things and substances that once served him toward the attainments of his base and degenerating pleasures.

CHAPTER XXVIII

THE VALUE OF SALT IN MEDICINE

The therapeutic value of salt has been known and utilized by the medical profession from time immemorial. Its preservative qualities are referred to in the "Sermon on the Mount" as symbols for strength and purity of human character. In the philosophy of the Rosicrucians, when medicine was yet regarded as an art, and the practitioner a high priest in the temple of life, receiving his inspirations or instructions from powers inherent as principles in the elemental world, salt occupied an important position in the group of agents sustaining the integrity of human life. In the studies and researches of these inspired dreamers, salt came next to the "Red Powder" as a governing element in the vital compound which has survived in name, if not in virtue, as the "Elixir of Life."

Like sugar, its twin element, salt bears a twofold relation to the evolutionary process —evaporation and condensation. Applied to human life and its vegetative necessities,

these qualifications give to salt its unique power of loosening or binding, setting free or locking up, drawing in or pushing out the organized pistons and levers of the human engine.

The virtue of the salt-water bath finds in this fact its cause and explanation. By its contact with the cuticle it starts in every pore a process of evaporation, by which a stream of stagnant humors is forced out through the skin, while the simultaneous process of condensation creates a demand for an increase of the blood-stream, and subsequent stimulation of the system toward a renewal and re-inforcement of its tissues and capillaries throughout the entire vascular exchange.

If the exposures to the saline influence, however, becomes too frequent, and the products of condensation are formed at a faster rate than the systemic circulation can dissolve and eliminate, the consequences will be a walling up of the pores by a mass of impenetrable crystalizations.

This condition often gives rise to foul, running sores on the bodies of people whose occupation keeps them exposed to the influence of salt, such as salt-works operatives, swimming-teachers, and natives of islands where a mild temperature and easy access to water offer great opportunities for salt

sea bathing. The ulcerations of the skin, which are almost typical to the inhabitants of the Hawaiian and other South Sea Islands, are due to an excessive exposure to salt. The rapid accumulation of sediments in the pores due to an enforced evaporation, is over-balancing the disolving power of the blood and lymph, while the perversion of the nerve power back of the vascular exchange results in a collapse of the mechanism of normal elimination. In place of proceeding along the natural channels through the pores and orifices of elimination, the latter breaks out through the surface of the skin in the form of eruptions, boils and running ulcers.

Like sugar, salt is a great stimulant. In cases of extreme exhaustion, due to extensive loss of blood, saline solutions, subcutaneously injected, almost miraculously restore the patient to life and health. The Rational of this process is identical with the one above described. The inherent centrifugal motion governing the nature of the salt, expressed in its two phases of evaporation and condensation, by setting free the fluids available in the various tissues of the body, succeeds in maintaining the action of the systemic circulation until the blood manufacturing functions have found time and means to

replenish the body with a medium for an adequate vascular exchange.

This therapeutic influence of salt on the mucus membranes of the body, renders it a very valuable remedy in the treatment of catarrh in the nose and pharyngeal structures. The immersion of the entire face in a normal salt solution, while allowing the fluids to flow up through the nose, down the pharynx and out through the mouth, will cause the inflamed membrane to give off its stagnant serum and at the same time induce an increased action of the blood stream, with the subsequent reconstruction of the diseqsed and broken-down cellular tissues.

The same principle that governs the action of Sodium Chloride (our common salt) is a factor in the behavior of all other salts in organic or inorganic chemistry. The action of Mercurial Salt on the syphilistic tissues its explanation in the unfoldment of the same principle of evaporation and condensation. The key which fits every physiological or pathological problem, where the action of salt is involved, is contained in the simple fact of its being a product of oxidation. It is an ash remaining after the combustion of any oxidizable or combustible element. The difference between oxidation and combustion consists in the character of the sub-

stance involved. Disolution of an organized substance means combustion and results in the liberation of water, Carbon-Dioxide, and ash; the dissolution of a mineral substance is characterized as oxidation, and gives off Oxygen, Hydrogen and Salt.

It is this devitalized or evacuated condition of salt that lies back of its powers to give rise to processes of evaporation and condensation in substances, with which it comes in touch. For just as fire, by transmitting its rythm or key note of molecular vibration to surrounding substances, spreads the conflagration, in its own destructive fashion; so in a similar way, salt to the extent it predominates, reduces substances to its own characteristics. The same principle is applicable to the phenomenal structure of ice. It is the principle of contagion at work in all nature, the transposition of molecules along a rate or rythm of vibration diverging from the original normal. This power of transmitting an impulse along a current of molecular vibration from one object to another is noticed in the transmission of sound from one violin to another of the same key, though separated by every other means than that of rythm; and it is this same power of rythm that enables one substance to transmit its own state of vitality or disolution to any

other rythmically responsive substance, be it through the medium of fire, ice, rust, fever, inflamation or corruption. It is the power of this rhythmic influence, exercised by the body, mind or soul on animate or inanimate nature, that causes the rising or sinking of entities from one state into another, from normal into abnormal, from health into disease, or vice versa, according to the character of the initiating impulse, and to the receptivity of the substance or subject under influence.

Applied to human tissues, salt may spell construction or destruction, according to the intensity and duration of the application. If applied long enough so as to permanently transpose or transmit the rate of its own vibration to the involved tissues, the latter may gradually become organized into a state of progressive dissolution. Mercurial ulcers of progressive dissolution. Mercurial ulcerations, which often result from a protracted application of these salts to syhphilistic tissues, at once illustrate and demonstrate the power of salt to impart its ratio of molecular vibration to tissues to which it is applied, and thus perpetuate its own characteristic tendency of disolution to processes of corrosion and corruption of the human flesh. It brings up the spectacle of elemental

dissolution transmitted to animated tissues. The process of a living creature slowly transformed into a physiological ash-heap, through the physiological wild-fires raging through his substance. Employed as a vaginal douche or rectal enema, the action of salt exhibits the same constitutional characteristics. The presence of the saline solution in the intestine starts at once its dual phase of activity—evaporation and condensation; the former expelling the bowel contents by the expansive force of the evolution of vapor, the latter causing a physiological drainage of the more or less congested mucous lining of the intestines. The former process empties the bowels through mechanical expulsion, the latter purges them by chemical displacement. By its nature a chemical ash, the action of salt on any tissue is toward reduction by processes identical to those that caused its own dissolution. The practical application of salt as a therapeutic agent is thus indicated in cases wherever a reduction or drainage of tissues is required, as in the case of fatty degeneracy, adiposis, congestion and inflammation of tissues, internal or external.

It is furthermore this characteristic of Sodium Chloride that invests it with the power of a universal solvent. Albumen owes

its solubility principally to the action of salt. It disolves pure casin and impedes the coagulation of the fibrin of the blood. While the permanent constitutional presence of socium chloride in the blood shows but a small percentage, 5 to 1000, its incidental presence in pathological products is immense, indicating its great importance in processes of secretion and elimination of alien substances. Hence in the course of any inflammation, notably pneumonia, pleurites and hectic fevers, etc., the Sodium Chlorid of the system is so extensively engaged in neutralizing and normalizing the pathological processes that for the time being it entirely disappears from the urine. Its return in the urinary excretions is in the nature of a critical phenomenon and marks the subsidence of the inflammation. It is this importance of salt in the system as a pathological adjuster and antitoxic corrective, that may explain the almost irresistable craving for salt by people whose foods are more or less made up by toxic elements, such as grease, alcohol, pastry and dried beans, etc. —a craving which has no basis in the attractiveness of its taste, and yet exceeds by far the physiological need of the system.

In ulceration and infection of the bowel, there is no remedy surpassing in safety salt

efficiency, a gallon of warm, normal and solution retained in the bowel some ten or fifteen minutes and then permitted to slowly pass out. In diabetes, uremia, typhoid, intestinal catarrh, etc., the curative power of saline enimas in eliminating decomposing and coagulated albumen and catarrhal sloughs are really surprising. If aided by diet, a proper colon treatment of saline solution may permanently remove the evil of constipation. In the vomiting of pregnancy, injections of saline solutions, either per rectum or hypodermically, have often cured where other remedies have failed.

Latest pronouncements of leading European physicians, such as Dr. Huebsch, of the Imperial Hospital, Berlin, or Dr. William Hampdon, of London, are strongly in favor of salt as an internal remedy in the treatment of asthma and tuberculosis. Dr. Bourchardat of Vienna, observes that salt lessens the excretion of sugar in diabetes, and even diminished thirst. A recent writer in the London *Lancet,* claims that doses of 150 grains have cured intermittent fever.

In his famous system of Saline Therapy, the late Dr. Burgess, of Chattanooga, Tenn., has made wonderful discoveries in the healing powers of salt (Magnesium Sulphate, or Epsum Salt) in its application to human

ailments. One pound of this salt to each five gallons of bloodwarm water, taken either in the form of sitz bath, tub-bath, towel-bath, or internal-bath (enema) will accomplish wonders in ulcerations of the skin, in rheumatism and congestion in external organs.

For nervous subjects, a small pinch of ordinary table-salt in a glass of water, early in the morning, will arrest interior decomposition by a stimulation of healthy granulation, and thus increase health and strength. Its anticeptic qualities are readily seen in its power to destroy fetor from gangrenous sores and coagulated albumen and putrid casein. In fact its virtues are so universal in relation to the needs of the creatures of evolution, that its disappearance from nature would mean the extinguishing from the earth, with the exception of the Arctics, of every trace of organized life.

CHAPTER XXIX

THE VALUE OF SALT IN FOOD

The demand for salt in human nature, either consciously, as in the promptings of taste, or subconsciously, as in the elemental affinities of nutritional chemistry, is not a mere whim or caprice of a sportive sensation, developed into abnormal cravings, but the voice of a deep-going, fundamental, nutritional need.

The relation of salt to food is governed by the same principles as its relation to medicine. It is the principle of invigoration, arising from the processes of absorption and elimination; of condensation and evaporation. In the cooking and preparation of food, salt becomes a saving force in the chemistry of digestion. In place of having to supply from its own vital resources the vigor and strength lacking in cooked food, the system, by the action of salt, receives an artificial impulse for its digestion, by which the food-cells become receptive and responsive to the

dissolving and peptonizing actions of the digestive fluids.

From this, however, it is readily seen, that though salt added to the products of cookery, is a positive aid to digestion and assimilation; if used with fresh, uncooked vegetables, may give rise to excess. Nature needs no digestant for her products as long as the pistons and levers of her vito-magnetic mechanism are still intact, and unhampered by the wrecks of coagulated albuminoids and collapsed vascular viaducts, as the result of artificially-prepared foodstuffs. The presence of fresh, uncooked, unartificial foodstuffs in the stomach, brings out the full, unmodified charge of the virile, life-stirring, cell-energizing potency of the gastric secretions, adequate to deal with any food is useful and needful for individual health and strength. This, however, is not to serve as an argument in favor of the system of "unfired" or uncooked food, as no single "system," fired or unfired, can ever meet the requirements of individual physiological differences. If all stomachs were charged alike with unhampered natural virility, no cooking would be needed, but there are stomachs too feeble to respond to the strong polarizations of "unfired" food. The invalid stomach, having lost or forfeited its

constitutional birth-right of native nerve power, must need to have the spirit of the food reduced to a level of its own subdued life—a reduction easily attained by cookery. Hence cookery is a valuable expediency, and serves as an opiate to an over-wrought and over-balanced gastric nerve mechanism.

It is here, however, that salt comes in as a redeeming power to substitute, dynamically, what the food lost, vitally. By its power of inducing increased cellular drainage in vascular exchanges of the tissues, salt is capable of imparting a new impulse to the food, as the latter has been rendered inert, and vitally reduced, through cookery. And furthermore, it is this artificially induced explosions in the contents of the stomach, due to the expansive and condensive force of salt, that accounts for its tonic effect upon digestion.

On the other hand, as the general demand of the system for salt depends on the percentage of hydrochloric acid in the gastric secretions, the amount of salt to be used in the diet is not only to be governed by the cooked or uncooked condition of the food, but also by the composition of the gastric juices. And as the percentage of the gastric acidity, barring accidental irregularities, has its cause and root in mental conditions,

individual characteristics as a force in diet must never be lost sight of.

Nervous irritability and excess of Hydrochloric acid in the digestion are closely associated conditions. The high strung, nervous individual, with his gastric secretions already overcharged with hydrochloric acid, has positive needs for the solidifying influences due to the use of salt; while the individual of the phlegmatic type, with imperturbal nerves and fatty inclinations must lie guarded as to his use of a general saline seasoning of his cooked food-stuffs.

In the use of salt we have constantly before us the principle of excess and balance. The same force which, if used in accordance with physiological needs, will aid our digestion and circulation,—if used in excess of these needs, will strike us with hardening of the tissues, evaporation of the fluids, crystalization of the solids, and a fatal process of systemic calcification which, by transfixing the whole vascular exchange, may terminate into hopeless progressive regidity.

In the relation which the individual occupies to his environments he is continually brought to face the supreme lesson of self-control and self-renunciation—with usefulness and altruism as the motive powers of human existence.

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